Laerdal Suction Unit

Directions for Use

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1 Cautions and Warnings

Read these Directions for Use carefully, and become thoroughly familiar with the operation and maintenance of the LSU before using it.
The LSU should only be used by persons trained in the use of medical suction equipment.
The LSU is not suitable for use in the presence of flammable liquids or gases;
there can be a danger of explosion or fire.
Do not use the LSU under environmental conditions that are outside the ranges specified under section 11.6. This can endanger safety and adversely affect operation of the device.

Battery:

- To maintain satisfactory operation of the battery, it is recommended to place the LSU on continuous charge when not in use.
- The LSU must be placed on charge for a minimum of 24 hours to reach full battery capacity. The fast charging gives approximately 80% battery capacity after 3 hours (for a new battery). Please note that repetitive 3 hour charging is not recommended.
- If it is not possible to place the LSU on continuous charge when not in use, make sure the battery is charged for a minimum of 24 hours at least once a month.
- Do not store the battery when it is discharged; always fully charge the battery before storage.

Do not block the Exhaust Outlet during use. This will lead to reduced flow and can also cause damage to the LSU.

Do not use the Reusable version without a filter or the Float Ball. Use only the disposable Abbott liner with filter.
If overflow of liquid from the Canister into the pump is suspected, the LSU must be returned for service (see section 9). Overflow of suctioned material can damage the device.
Disconnect the LSU from external power prior to cleaning. Use a minimum of liquid to prevent any electrical shock hazard.

Do not immerse the LSU or allow it to stand in water or other liquids. This might damage the device, and cause electrical hazard.
Do not pump any cleaning solution or other liquids through the vacuum pump, i.e. through the Vacuum Connector. This can damage the LSU.
Use only accessories supplied by Laerdal or one of our authorised distributors to ensure that the LSU operates satisfactorily.

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2 Introduction

2.1 Unpacking and prepare the LSU for use

- Remove the LSU from its packaging and inspect all parts for damage. If there are any signs of damage or if any parts are missing, immediately notify Laerdal or one of our authorised distributors.
- Insert the battery according to section 6.7.
- Place the LSU on charge for a minimum of 24 hours to make sure you have a fully charged battery (see section 6.5).
- After being charged for 24 hours, perform the Device Test according to section 7.

2.2 Indications for Use

The LSU is a portable, electrically powered, medical suction equipment intended for field and transport use. It is intended for intermittent operation to remove secretions, blood or vomit from a patient´s airway to allow ventilation. Higher vacuum levels are generally selected for oropharyngeal suctioning, and lower vacuum levels are usually selected for tracheal suctioning and the suctioning of children and infants.

2.3 Contraindications

None known.

2.4 Features and Benefits

- Splashproof, rugged and solid.
- Easy access to the tubing.
- Equipped with an internal battery that can easily be replaced without using tools.
- Charging of battery can be done directly from AC or DC mains - no external charger is needed.
- Fast charge option of 3 hours, giving approx. 80% battery capacity.
- Operation possible from internal battery and directly from AC or DC mains - no adapter is needed.
- A large combined ON/OFF switch and vacuum selector makes operation easy even with heavy-duty gloves.
- A green LED bargraph makes it easy to observe the actual vacuum level during operation.
- Another green LED bargraph indicates approx. remaining battery capacity.

2.5 Limited Warranty

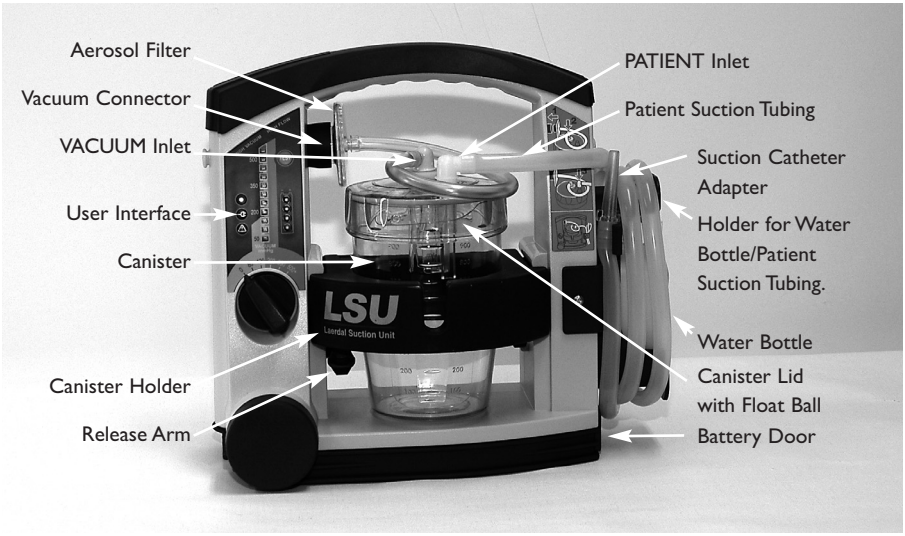
The LSU comes with a five (5) year limited warranty*. See the enclosed "Laerdal Global Warranty" for terms and conditions.
The warranty is also available at
www.laerdal.com

* Excluding the canister and tubing systems.

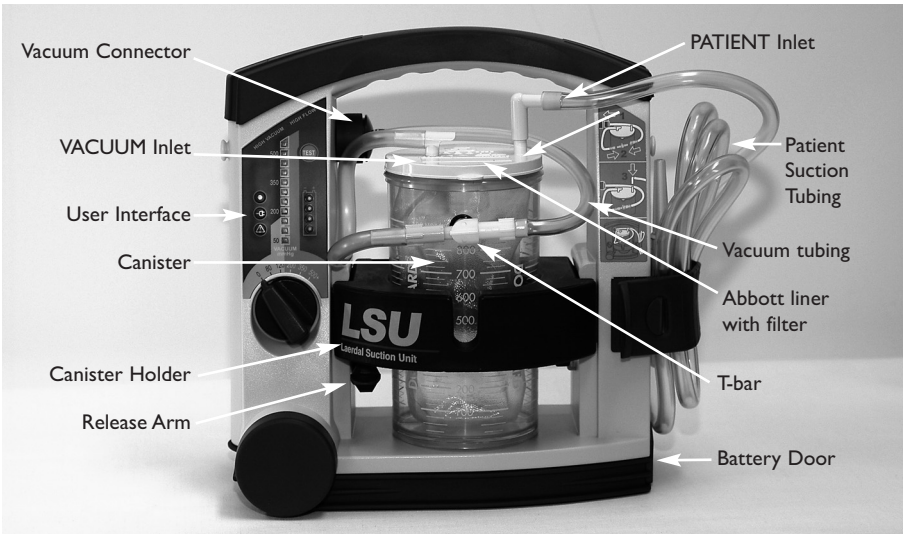
3 Description

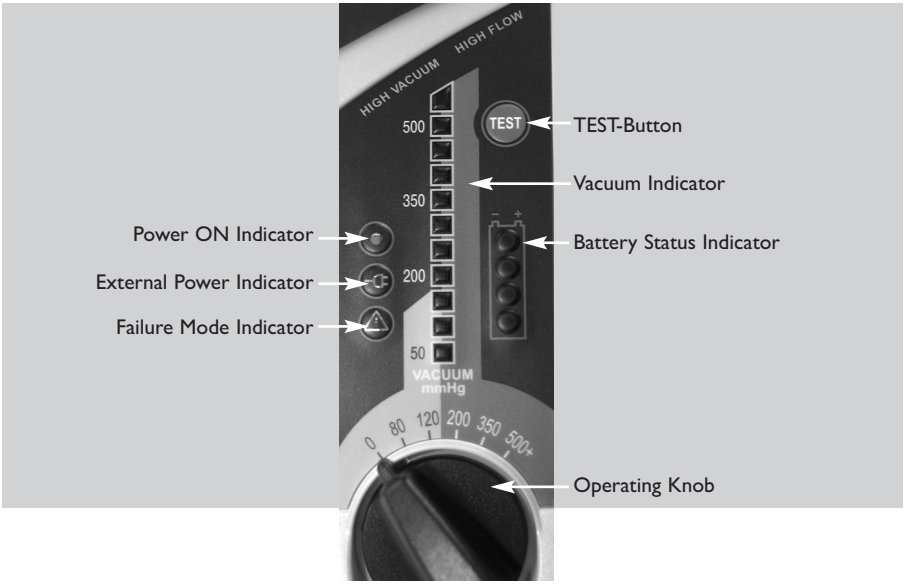
3.1 Quick Reference Guide

3.1.1 LSU w/Reusable Canister System



3.1.2 LSU w/Disposable Canister System





3.2 User Interface

3.2.1 Operating Knob

The Operating Knob is a combined ON/OFF switch and vacuum selector, located at the bottom of the User Interface.

The LSU is switched ON by turning the Operating Knob to the required setting. Each setting indicates the maximum achievable vacuum level for the selected position (80, 120, 200, 350, 500+ mmHg). The free air flow value changes along with the increasing vacuum settings (see section 11.4 for details). The LSU is switched OFF by resetting the Operating Knob to "0". Even if the Operating Knob is in "0" position, voltage is present on some of the internal circuitry, when the LSU is connected to mains. To fully remove power, pull out the Power Cord.

3.2.2 Indicators

3.2.2.1 Power ON Indicator

This green LED has 3 modes:

- It is lit continuously while the LSU is switched ON.
- It flashes rapidly (approx. twice per second) during the Device Test.
- It flashes slowly (approx. once per second) while the Automatic Power-save Function is activated, if the Device Test is interrupted or when the battery is discharged.

3.2.2.2 External Power Indicator

This green LED is continuously lit while external AC or DC power is connected.

3.2.2.3 Failure Mode Indicator

The red LED is lit when a possible malfunction of the LSU has been detected. If lit, turn the LSU OFF, and then ON again to check if the indication disappears. Provided that the indication does not occur again the LSU can be operated. If the Indicator continues to lit after three OFF/ON cycles and after replacing the battery with a fully charged battery, discontinue use and return the LSU for service. (See section 9).

3.2.2.4 Vacuum Indicator

This green LED bargraph displays the actual vacuum level during operation of the LSU.
Each fully lit segment represents 50 mmHg. If a segment has a weak light, this represents 25 mmHg (e.g 125 mmHg means 2 fully lit and 1 weakly lit segments).

mmHg	80	120	200	350	500
kPa	11	16	27	47	67
mBar	107	160	267	467	667

3.2.2.5 Battery Status Indicator

This green LED bargraph has 3 functions:
- Indicates remaining battery capacity during operation from internal battery
- Indicates approx. achieved battery capacity during charging
- Indicates which test is currently in progress during device test

During operation from internal battery:
- indicates approx. remaining battery capacity.
During operation from internal battery and during charging the displayed values must only be used as indications.
Several parameters can influence them e.g. device settings, state of battery, temperature etc.

Note:
Immediately after turning the LSU ON and immediately after switching from external power to internal battery operation, all 4 LED's will flash for 5 seconds before the remaining battery capacity is displayed.

CAPACITY for a new battery stored in room temperature	OUTPUT
> 75 %	4 LEDs lit.
50 - 75%	3 LEDs lit.
25 - 50%	2 LEDs lit.
< 25%	1 LED lit.
Battery Low; (min. 2 minutes of operation left based on 500+ mmHg/free flow).	1 LED flashes.

During charging: indicates approx. achieved battery capacity.

CAPACITY	OUTPUT*
< 75%	The LED's will be lit sequentially.
75 - 80%	3 LED's lit and 4th flashing.
> 80%	4 LED's lit.

**Note:*
If no battery is installed, the battery status indicator will be fully lit for approx. 5 sec. until it is turned off.

During the Device Test: indicates which step of the test is currently in progress or which corresponding test result is being displayed:
LED 1 (lower LED) lit = STEP 1,
LED 2 lit = STEP 2 etc.

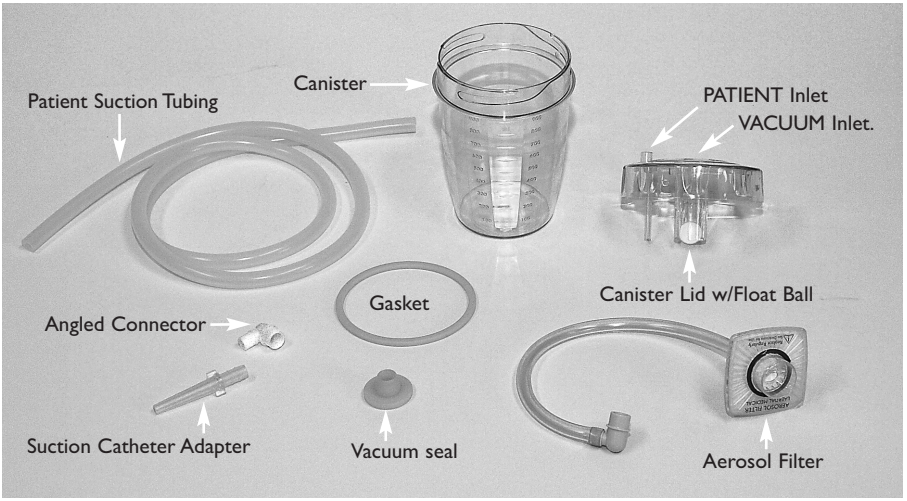
3.2.3 TEST-Button

This button allows you to run a 4-step user initiated Device Test program to identify whether the LSU is operating satisfactorily or if it needs service (see section 7).

3.3 Canister Systems

The LSU can be delivered with a Reusable or a Disposable Canister System as described below. Both Canisters have a corresponding sized Canister Holder.

3.3.1 LSU Reusable Canister System



The LSU Reusable Canister System consists of:

- A 1000 ml transparent plastic Canister.
- A Canister Lid w/Float Ball that prevents overflow if the Canister is full or the LSU tips over.
- An Aerosol Filter with tubing that protects the LSU by preventing aerosols from entering the Pump Unit.*

The Canister Lid contains a Float Ball that shuts off the vacuum if the canister is full or the LSU tips over. To reset the valve, remove the Angled Connector from the VACUUM Inlet.

The LSU Reusable Canister System must not be used without the Aerosol Filter or the Float Ball.

It is recommended always to have extra Aerosol Filters with the LSU in case one has to be discarded.

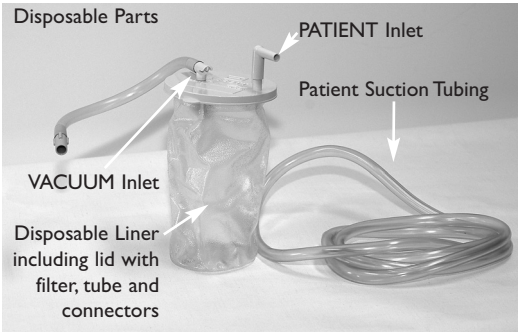
*The Aersol Filter is not intended for microbiological or for particle filtration.

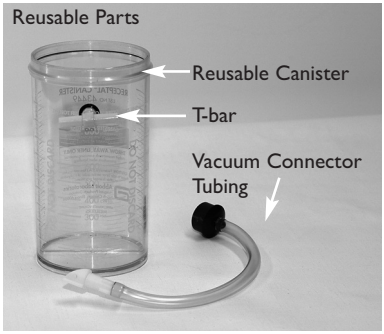
Decontamination must be performed in accordance with section 6.4.

For the Aerosol Filter the instructions below must be followed:

- The Aerosol Filter is not designed for decontamination.
- It is recommended that the Aerosol Filter be replaced after each use or at least once every shift. If the LSU is used on patients or in areas where cross contamination is not an issue, the Aerosol Filter should be replaced at least once a month.
- **If the Aerosol Filter becomes wet, it should be replaced immediately or as soon as possible after use.**

3.3.2 Disposable Canister System





The Disposable Canister System consists of:
- A 1000 ml reusable transparent plastic Canister including a Canister Connector.
- A disposable liner including lid with filter, tube and connectors.

The Abbott Receptal® Canister contains a hydrophilic filter that shuts off the vacuum if the canister is full or the LSU tips over. To restore the vacuum, replace the inner liner.

Note:
Do not use an Abbott liner without a filter!

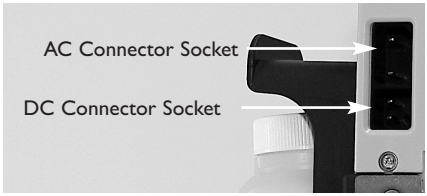
The disposable parts must be replaced after each use. The Reusable Canister must be cleaned as stated on the canister. The Vacuum Connector Tubing is reusable and should be cleaned in accordance with section 6.3.

A Filter Tubing is available for the Abbott Canister System (see section 8).

3.4 Power Sources

The LSU is delivered with an AC Power Cord for connection to AC mains and a DC Power Cord for connection to DC mains.
The device can be operated from the internal battery, and can be operated or charged from one of the following external Power Sources:
- AC mains when used with the AC Power Cord: 100-240 VAC (50/60/400 Hz).
- DC mains when used with the DC Power Cord: 12-28 VDC.

A Wall Bracket to hold the LSU during operation and (optional) charging is available separately (see section 8).



External power connection will cause the External Power Indicator to be lit. Always check that it is lit when connecting external power or inserting the LSU into the Wall Bracket.

3.5 Automatic Power-save Function

The LSU has an Automatic Power-save Function that switches the pump motor off. While in this mode, the Power ON Indicator will flash slowly (approx. once per second).

This function will be activated when the Operating Knob is set to 200, 350 or 500+ mmHg and the actual vacuum level has been continuously higher than 120 mmHg for more than 2 minutes.
To exit the Power-save Mode and revert to normal operation, set the Operating Knob to any other position and then go back to required setting.

4. Operating LSU with Reusable Canister

Note: Read all the Cautions and Warnings listed in section 1 thoroughly before you use the LSU. The parts are color coded to help re-assembly after cleaning.

4.1 Getting Started

1. Check that no parts are missing and that all parts are clean.
2. If you decide to operate the LSU from external power, connect to either external AC or DC power as described in section 3.4.
   If you decide to operate the LSU from internal battery, check that the battery is installed.
3. Ensure that the Patient Suction Tubing is securely connected to the PATIENT Inlet on the Canister Lid; and the Aerosol filter is securely fastened in the LSU and the lid.

4 Unwrap the Patient Suction Tubing.

Note: The LSU must be operated in the upright position to prevent overflow of suctioned material.

5. Set the Operating Knob to the required vacuum level. The LSU will automatically be switched ON and start to operate.
   The green Power ON Indicator is lit continuously while the LSU is switched ON.
6. When suction is complete, set the Operating Knob to "0"

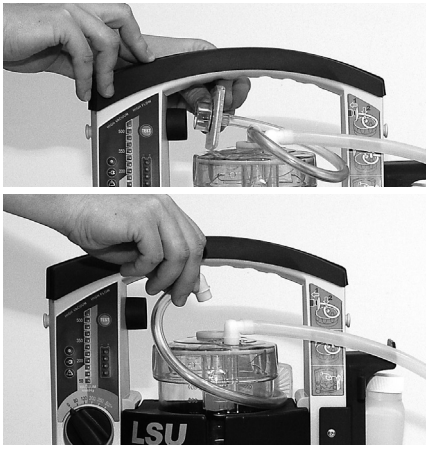
Note: To prevent overflow, the LSU must be transported in an upright position when the canister contains suctioned material.

4.2 Emptying the Canister

Note: To prevent damage and keep the LSU in good working order; empty the canister when 3/4 full. Check the filter after each use.

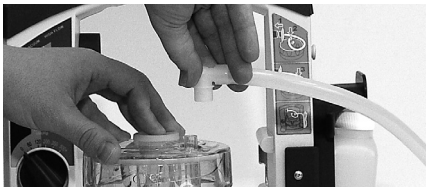
If the filter is broken so liquid penetrates the membrane, the pump will be contaminated, and the LSU must be returned for service (see section 9).
When liquid reaches the top of the Canister, the LSU will stop suctioning. To continue suctioning, empty canister and replace the filter.
Over flow of suctioned material can damage the device.

To remove the Canister, proceed as follows:



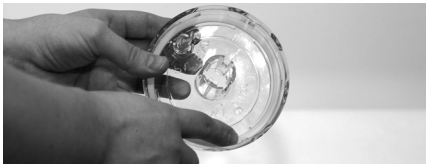
1. Disconnect the Filter Tubing from the blue Vacuum Inlet (see section 3.3.1 regarding handling instructions for the Aerosol Filter).

2. To release the Canister Holder, press down the Release Arm while sliding the Holder towards you. Remove the Canister from the Holder.

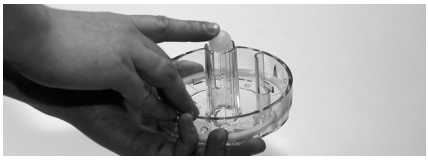


3. Release the Patient Suction Tubing (if applicable).
4. Safely dispose of the contents of the Canister according to local protocols.
5. Clean the LSU according to section 6.3 and its reusable parts according to section 6.4.

4.3 Assembly of the Reusable Canister System



1. Place the yellow Gasket in the Lid, make sure that the gasket is placed flat in the Lid and not twisted.

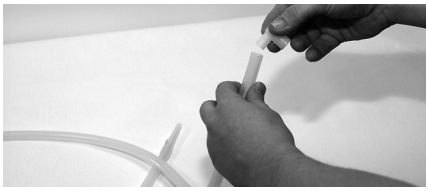


2. If the Float Ball has been removed, hold the lid upside down and snap the ball into place as shown.

Note: Never use the LSU without the Float Ball.

3. Secure the Lid to the Canister by turning it clockwise until it is securely fastened.

4. Connect the Suction Catheter Adapter to the Patient Tube.



5. Connect the Angled Connector to the Patient Tube.

6. Mount the yellow Vacuum Seal in the centre hole of the Lid and push it into place.

7. Connect the Aerosol Filter (blue ring) to the blue Vacuum Inlet on the LSU. (Color code: Blue on Blue)

8. Insert the Canister in the canister holder and slide it into the LSU.

9. Connect the yellow Angled Connector to the yellow Vacuum Seal
(Color code: Yellow on Yellow)

10. Connect the Angled Connector on the Patient tubing to the PATIENT Inlet on the canister Lid.
11. Perform the Device Test according to section 7

12. Wind the Patient Tubing on the Patient Tubing Holder
13. Place the LSU on charge (see section 6.5)

Note: Connect tubing according to color code: Blue on Blue & Yellow on Yellow.

4.3.1 Reusable Canister System Quick reference

The assembly of the tubing is illustrated on the right side of the LSU.

1. Connect the blue Aerosol filter to the blue Vacuum Inlet.
2. Connect the yellow angled connector to the yellow Vacuum Seal.
3. Connect the Patient Tubing to the Patient inlet.

4.4 After Use

- When suction is complete, set Operating Knob to "0" and inspect all parts for damage or excessive wear. Replace parts if necessary.
- Clean the LSU according to section 6.3 and its reusable parts according to section 6.4.
- Perform the Device Test according to section 7.
- Place the LSU on charge (see section 6.5).

5. Operating LSU with Disposable Canister

5.1 Getting Started

Note: Read all the Cautions and Warnings listed in section 1 thoroughly before you use the LSU.

1. Check that no parts are missing and that all parts are clean.
2. If you decide to operate the LSU from external power, connect to either external AC or DC power as described in section 3.4. If you decide to operate the LSU from internal battery, check that battery is installed.
3. Ensure that the T-bar is securely tightened and the yellow connector from the Abbott liner goes to the yellow T-bar on the canister. (Yellow on Yellow).
4. Connect the blue Vacuum Tubing connector to the blue Vacuum Inlet on the LSU. (Blue on Blue). Connect the yellow connector to the yellow T-bar (Yellow on Yellow).
5. Ensure that the Patient Suction Tubing is securely connected to the PATIENT Inlet on the Canister Lid.

6 Release the Strap holding the Patient Suction Tubing.

Note: The LSU should be operated in the upright position to prevent overflow of suctioned material.

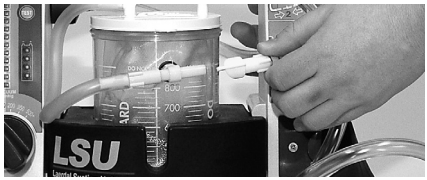
7. Set the Operating Knob to the required vacuum level, and the LSU will automatically be switched ON and start to operate. The green Power ON Indicator is lit continuously while the LSU is switched ON.
8. When suctioning is complete, set the Operating Knob to "0"

Note: To prevent overflow the LSU should be transported in an upright position when the canister contains suctioned material.

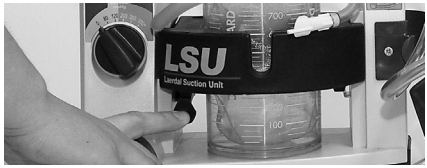
5.2 Replace the Disposable Canister

Note: It is recommended to replace the Canister when it is 3/4 full.
When liquid reaches the top of the Canister, the LSU will not suction any more liquid. If over flow of liquid from the Canister into the pump is suspected, the LSU must be returned for service (see section 9).
Over flow of suctioned material can damage the device.

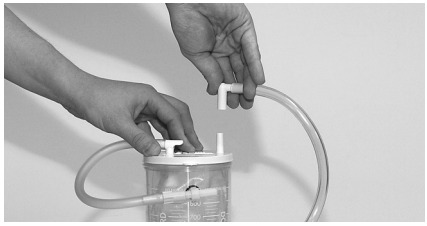
To remove the Canister, proceed as follows:



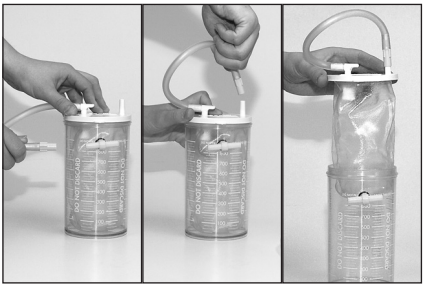
1. Disconnect the Vacuum Connector Tubing at the yellow T-bar on the canister Connector.



2. Release the Canister Holder, press down the Release Arm while sliding the Holder towards you.
3. Remove the Canister from the Holder.

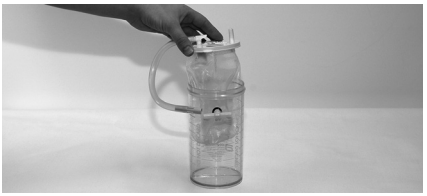


4. Unwrap/release the Patient Suction Tubing (if applicable).



5. Safely dispose of the Abbott Liner according to local protocols.
6. Clean the LSU according to section 6.3.

5.3 Assembly of the disposable canister system



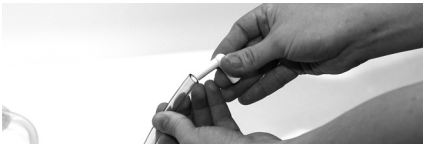
1. Mount the Disposable Abbott Liner in the Abbott Canister

2. Make sure that the yellow T-bar is securely tightened. Connect the yellow connector from the Abbott Liner to the yellow T-Bar on the Abbott Canister.
   (Color code: Yellow on Yellow).

3. Connect the blue Vacuum Connector on the Vacuum Tubing to the blue Vacuum Inlet on the LSU.
   (Color Code: Blue on Blue).

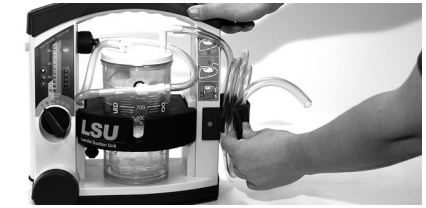
4. Insert the Canister in the in the Canister Holder and slide it into the LSU.

5. Connect the yellow Connector on the Vacuum tubing to the Yellow T-Bar on the Abbott Canister (Color code: Yellow on Yellow).



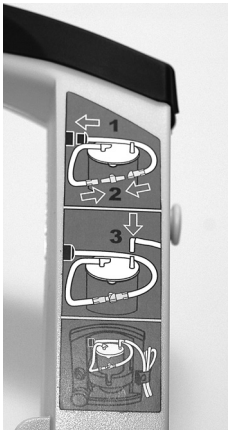
6. Connect the white Angled Connector to the Patient Tubing

7. Connect the white Angled Connector to the white PATIENT INLET on the Abbott Liner (Color code: White on White)
8. Perform the Device Test according to section 7



9. Strap the Patient Tubing to the side of the LSU.
10. Place the LSU on charge (see section 6.5)

Note:
Connect tubing to color code: Blue on Blue, Yellow on Yellow & White on White.



5.3.1 Disposable
Canister System Quick reference

The assembly of the tubing is illustrated on the right side of the LSU.

1. Connect the blue Vacuum Connector on the Vacuum Tubing to the blue Vacuum Inlet.
2. Connect the two yellow connectors to the yellow T-bar on the Abbott canister.
3. Connect the white Patient Tubing to the white Patient inlet.

5.4 After Use

- When suction is complete, set Operating Knob to "0" and inspect all parts for damage or excessive wear. Replace parts if necessary.
- Clean the LSU according to section 6.3.
- Perform the Device Test according to section 7.
- Place the LSU on charge (see section 6.5).

6. Maintenance

6.1 General

- Make sure the maintenance instructions under section 4.4 and 5.4 are followed.
- If the device is not in frequent use (i.e. less than once a month), the Device Test (see section 7) should be performed both on a monthly basis and after each use.

6.2 Battery

- To maintain satisfactory operation of the battery, it is recommended to place the LSU on continuous charge when not in use.
- Replace the battery when it does not pass the Battery Quality Check (see section 6.6 for details), or after 3 years.
- Do not store the LSU with an empty battery.

6.3 Clean the Cabinet

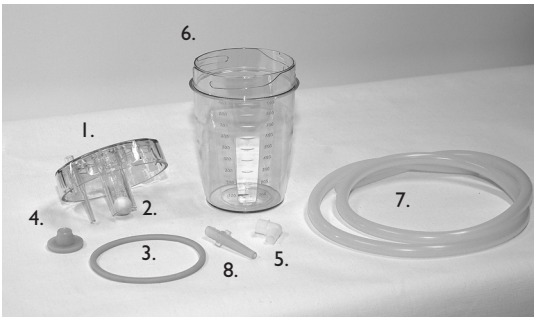
Warning: Disconnect the LSU from external power prior to cleaning.

Use a minimum of liquid to prevent any electrical shock hazard. Do not immerse the LSU or allow it to stand in water or other liquids. This can damage the device, and cause electrical shock resulting in injury to persons.

- Use a cloth or sponge that is dampened with a mild detergent (hand dishwashing liquid or similar) to clean the external surfaces of the LSU. Use a detergent that is compatible with the materials listed under section 11.7, and follow the detergent manufacturer´s instructions.
- Use a cloth or sponge dampened with water and wipe the surfaces again.
- Dry the surfaces using a clean cloth or a paper towel.

6.4 Decontamination of Laerdal Reusable Canister

6.4.1 Parts to be Decontaminated



After Each Use:

1. Canister Lid
2. Float Ball
3. Gasket.
4. Vacuum Seal
5. Angled Connectors
6. Canister
7. Patient Suction Tubing
8. Suction Catheter Adapter.

6.4.2 Preparation

- Remove and empty the Canister according to section 4.2
- Disassemble the Canister into separate parts as indicated in the picture above.
- The Float Ball on the reusable canister can be snapped out of the lid.

6.4.3 Rinsing

- Rinse all parts under cold running water.
- Immerse in warm water (30-40°C).

6.4.4 Cleaning

- Immerse all parts in hot water (60-70°C) containing a mild detergent (see section 6.3).
- Thoroughly clean all surfaces, use a brush where possible.
- Rinse in warm water and allow to dry.
- Inspect all parts to be visibly clean and dry.

Note:

Thorough rinsing and cleaning are very important steps prior to disinfection.

6.4.5 Disinfection

To disinfect the parts, the following methods are recommended:

Method	Temperature/ Concentration	Contact time	Post-treatment
Glutaraldehyde	Room temperature/ Conc.: 2%	60 minutes	Rinse all parts in clean, warm water. Allow to dry.
Sodium Hypochlorite, (not cleared for use in the US)	Room temperature/ Conc.: 0.5%	20 minutes	Rinse all parts in clean, warm water. Allow to dry.
Virkon	Room temperature/ Conc.: 1%	10 minutes	Rinse all parts in clean, warm water. Allow to dry.
Steam autoclaving	Autoclave at max. 121° C	20 minutes	Allow parts to cool.

6.5 Charge the Battery

The internal rechargeable Lead-Acid battery can be charged directly from external AC or DC power as described in section 3.4. No external charger is needed. To charge the battery, proceed as follows:

1. Make sure the Operating Knob is set to "0". Connect either external AC or DC power to the LSU and charging will start automatically.
2. During charging the Battery Status Indicator will indicate approx. achieved battery capacity (see section 3.2.2.5 for details).
3. The LSU must be placed on charge for a minimum of 24 hours to reach full battery capacity. The fast charging gives approx. 80% capacity after 3 hours (for a new battery). Repetitive charging for only 3 hours is not recommended.

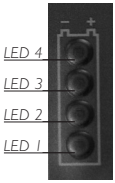
Note:

- *To maintain satisfactory operation of the battery, it is recommended to place the LSU on continuous charge immediately after use.*
- *It is recommended to always fully charge the battery. Repetitive charging to a lower capacity level will reduce battery life.*
- *If it is not possible to place the LSU on continuous charge when not in use, make sure the battery is charged for a minimum of 24 hours at least once a month.*
- *Do not store the battery when it is discharged. Always fully charge the battery before storage.*
- *The recommended ambient temperature for charging is from 15°C to 25°C.*
- *The battery will not be charged when the LSU is in operation.*
- *If no battery is installed, the battery status indicator will be fully lit for approx. 5 sec. until it is turned off.*

6.5.1 External Battery Charge

The LSU battery can also be charged in an optional External Battery Charger. See section 8.

6.6 Check the Battery Quality



If poor battery quality is suspected, charge the battery for a minimum of 24 hours and then perform the following test without connection to external power:

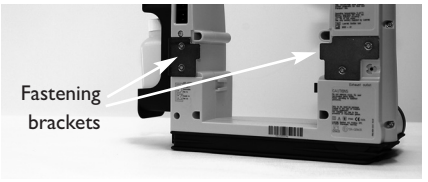
- Run the Device Test and then let the LSU operate continuously at 500+ mmHg setting and free air flow for 20 minutes.
- If the LSU stops before completing the 20 minutes, the battery should be discarded.

6.7 Replace the Battery

Note:
Use only batteries recommended by Laerdal.

1. Open the Battery Door.
2. To remove the battery, push and move it slightly to the left and then release.
3. Withdraw the battery from the LSU.*
4. To insert a battery, push it fully in and then to the right to lock it.
5. Close the Battery Door.
6. After inserting the battery, place the LSU on charge unless a fully charged battery is inserted.

**When you discard the battery, dispose of safely in accordance with local protocols for sealed lead acid batteries.*



6.8 Fastening brackets

The fastening bracket is used to hold the LSU in the optional wall bracket. Inspect the fastening brackets for wear and tear regularly.
Replace if worn. See section 8.

6.9 Release arm for Canister holder

An extra release arm for the canister holder can be attached. See section 8.

7 Device test

The Device test is user initiated test program for all models which can identify whether the LSU operates satisfactorily or if the LSU needs service.

The program runs 4 different tests:

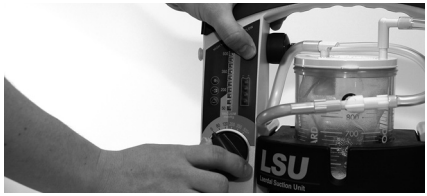
1 It tests for occlusions in the Suction System (including canister and tubing)
2 It tests the vacuum build-up efficacy of the Pump System (How much vacuum is built up within 3 seconds)
3 It tests the maximum achievable vacuum level of the LSU (reaches this level within 10 seconds)
4 It tests if there are air leakages in the Pump System (including canister and tubing)

7.1 Setup

Before the test can be performed make sure that:

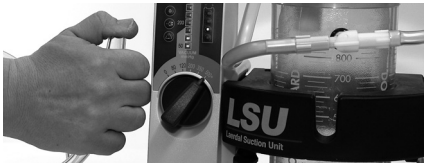
- The Patient Suction Tubing is unwound and not blocked or bent
- The Suction Catheter Adapter is removed from its holder (if applicable)
- The canister lid, T-bar, angled connector and tubing are securely fastened.

7.2 Run the Test



1 Press and hold the TEST-Button while setting the Operating Knob to 500+ mmHg.

Note: Do not release the TEST-Button until min. 2 seconds after the Operating Knob has been set to 500+ mmHg. The test will start immediately



2 As soon as LED 2 from the bottom of the Battery Status Indicator comes on (takes approx. one second), fully block the Patient Suction Tubing until all 4 LED's have illuminated and LED 1 lights up again.*

3 Keep the tubing blocked while LED 2 , 3 and 4 lights up.

4 Release the tubing when LED 1 comes on again
5 Evaluate the test results (See section 7.3)
6 After evaluating the test results turn the Operating Knob to "0" to exit the Device Test.

Note:
If you need to interrupt the test and revert to normal operation, turn the Operating Knob to another position and then select the required setting.

Note:
To indicate that the LSU is in test mode, the Power ON Indicator will flash rapidly (approx. twice per second) until you exit the test program.

** If the tubing is not occluded within 2 minutes, the test will be interrupted and the Power ON Indicator will start to flash slowly (approx. once per second). To restart the test, set the Operating Knop to "0" and start over again.*

7.3 Evaluation of Device Test Results

After the test is completed, the Vacuum Indicator will automatically display the first result (blockage). To display the other results press the TEST-Button once for each test. If you continue pressing the button after the 4th test result has been displayed, the earlier results will be repeated (Test 1,2,3,4,1,etc.). To exit the test program, set the Operating Knob to another position.

Test no	The program has tested for	Battery indicator:	Test result indications	Action if test failed
Test 1	Blockage in the Suction System (including canister and tubing	LED #1 lit up	Test Passed ≤100 mmHg Fail 100 mmHg Pass	Check possible blockages (e.g. twisted tubing, blocked filter, blocked filter in the liner) and run the Device. Test again.
Test 2	The vacuum build-up efficacy of the Pump System (How much vacuum is built up within 3 seconds)	LED #2 lit up	Test Passed ≥300 mmHg Pass 300 mmHg Fail	Check Connectors, Tubes and Canister Lid for leakage* or damage. Check exhaust outlet for occlusion and run the Device Test again
Test 3	The maximum achievable vacuum level of the LSU (reaches this level within 10 seconds)	LED #3 lit up	Test Passed ≥500 mmHg Pass 500 mmHg Fail	Check Connectors, Tubes and Canister Lid for leakage* or damage. Check exhaust outlet for occlusion and run the Device Test again
Test 4	Air leakages in the Pump System (including canister and tubing)	LED #4 lit up	Test Passed ≥450 mmHg Pass 450 mmHg Fail	Check Connectors, Tubes and Canister Lid for leakage* or damage and run the Device Test again

** If it is not obvious where the system is leaking: go step by step through the connections. Start by disconnecting the Vacuum Tube at the Canister and run the Device Test (blocking the tube). Reconnect the tube and disconnecting the patient tube, run device test (block the PATIENT inlet on the Canister). Continue with other connections until the leakage is identified.*

Note: If the LSU does not pass one or more of the steps in this test after suggested actions are taken, the device might need to be returned for service (see section 9).

8. Accessories and Parts

Cat. No.	Description
78 00 00	LSU w/Reusable Canister
78 00 10	LSU w/Abbott Receptal® Canister

Consumables

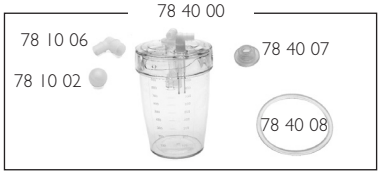
78 12 00	Aerosol Filter for LSU Reusable Canister
78 12 01	Vacuum Tube for LSU Abbott Canister
78 12 02	High Effiency Filtration kit for LSU Abbott Canister
77 04 61	Abbott Disposable Liner

Accessories

78 20 00	Carrying Bag (full covering)
78 20 10	Semirigid carrying bag
78 26 00	Wall Bracket w/DC-Power Cord
78 26 10	Wall Bracket w/AC-Power Cord US
78 26 20	Wall Bracket w/AC-Power Cord EU
78 26 30	Wall Bracket w/AC-Power Cord UK
78 26 40	Wall Bracket wo/ Power Cord
78 23 00	Shoulder Strap
78 24 00	Side Pouch
78 04 40	External Charger kit

Parts

78 03 00	Directions for Use
77 04 10	Suction Tubing 150 cm w/o tip
65 01 13	Suction Catheter adapter, pkg. 10
78 40 00	LSU Reusable Canister
78 04 30	LSU Reusable Canister Holder
78 10 06	Angled Connectors, pkg. 10
78 10 02	Float Ball, pkg. 10
78 40 07	Vacuum Seal
78 40 08	Gasket
79 35 00	Water Container
77 04 62	Abbott Receptal Canister
78 04 10	Abbott Canister Holder
78 04 14	T-bar for Abbott Receptal Canister pkg. 5
78 04 33	Strap for Tubing
78 04 32	Release Arm
78 02 00	DC-Power Cord
78 02 10	AC-Power Cord US
78 02 20	AC-Power Cord EU
78 02 30	AC-Power Cord UK
78 04 00	LSU Battery
78 04 36	Fasten bracket left/right
78 04 35	Holder for water bottle



Note: Parts or product configurations are subject to change without notice.

9. Servicing

There are no user serviceable parts inside the cabinet. Do not open cabinet.
Refer servicing to personnel qualified by Laerdal, or to Laerdal or one of its authorised distributors.

10. Trouble Shooting

FAULT	CONDITION	ACTION
The LSU does not operate with the AC or DC Power Cord connected.	External Power Indicator is not lit when the Operating Knob is set to "0".	Check power cord connections and the external AC- or DC-power source.
	External Power Indicator is lit.	The LSU must be returned for service (see section 9).
The LSU cannot be operated from the internal battery.	Power ON Indicator is OFF.	Check that battery is installed.
		Place the LSU on charge.
		If still faulty after charging completed, remove and replace the battery (see section 6.7).
The LSU operates, but little or no suction available.	Vacuum Seal blocked by float ball.	Unplug the Vacuum Seal to release the vacuum
	Canister full.	Remove and replace the Canister (see section 4.2 or 5.2)
	Poor vacuum connection between Pump Unit and Canister.	Install the Vacuum Connector Tubing correctly.
	Patient Suction Tubing twisted or blocked.	Replace the filter or liner if the filter is blocked Untwist the Patient Suction Tubing and/or clear blockage or replace the tubing.
	T-bar on the Abbott canister is leaking air into the tubes. The Abbott liner is leaking	Tighten the T-bar by screwing it in or replace it. Replace the Abbott liner
Battery Status Indicator is not ON.	Battery is not charged.	Check power cord connections and that battery is installed
Vacuum Indicator indicates more than 100 mmHg with free air flow	Tube(s) is kinked or twisted	Straighten / untwist the tube(s).
The LSU does not charge with the AC or DC power cord connected	The external Power indicator is not lit.	Check power cord connections and the external AC- or DC-power source. The LSU must be returned for service (see section 9).

11. Specifications

11.1 Classification

Electrically powered medical suction equipment for field and transport use, according to ISO10079-1:1999.
High vacuum/high flow.
Not suitable for use in the presence of flammable liquids or gases.
Internally powered/class II equipment type BF, according to IEC 601-1:1988.
Protection class IP34D*, according to IEC 529:1989.

* - Protected against solid foreign objects of 2,5 mm Ø and greater
- Protected against splashing water
- Protected against access with a wire

11.2 General tolerance

Overall tolerance ±5%

11.3 Physical Characteristics

Size:	315 mm (12,4 in) x 330 mm (13 in) x 160 mm (6,3 in), (h x w x d)
Weight:	4kg (8,9 lbs) (including battery)
Canister Capacity:	1000 ml
Canister graduation accuracy:	±5% of full scale
Patient Suction Tubing (non-sterile):	8 mm (0.315 in.) inside diameter x 1.5 m (59 in.) length

11.4 Operation

Approx. free air flow at different settings:

80 mmHg	120 mmHg	200 mmHg	350 mm Hg	500+mmHg
12 sl/min.	16 sl/min.	20 sl/min.	23 sl/min.	> 25 sl/min.

sl = litre at standard atmospheric pressure and temperature.

Approx. battery operation time (free air flow) at different settings (±10%):

80 mmHg	120 mmHg	200 mmHg	350 mmHg	500+mmHg
3h 20 min	2h 20 min	1h 30 min	1h	45 min

Approx noise levels (free air flow) at different settings:

80 mmHg	120 mmHg	200 mmHg	350 mmHg	500+mmHg
46 dBA	48 dBA	51 dBA	53 dBA	56 dBA

Vacuum - Max.: > 500 mmHg (67 kPa).
Vacuum - Range: 80 - 500+ mmHg (11 - 67 kPa).
Vacuum Indicator accuracy: ±5% of full scale.

11.5 Power Requirements

Operating/charging AC:** 100-240 VAC +10%/-15%, 50-60 Hz +/- 3 Hz (100-240 VAC), 400 Hz +/- 3 Hz (100-120 VAC)
Operating/charging DC:** 12-28 VDC +/-10%.
Battery: 12 VDC 2 Ah, Sealed Lead-Acid, rechargeable.
Charging Time: 3 hours for approx. 80% battery capacity, 24 hours for fully charged.
Fuses: The LSU has no fuses to be replaced by the user (see section 9).

*** The external AC power source must be able to deliver a current of min. 1A and the external DC power source min. 6A, if not the LSU may switch to battery operation.*

11.6 Environmental Conditions

Operating/Charging Temperature:
0° C (32°F) to + 40° C (104° F).
Recommended Charging Temperature:
15°C (59°F) to + 25°C (77°F).
Long term Storage Temperature:
0° C (32°F) to + 40° C (104° F).
Max. 24 hour Storage Temperature:
-30° C (-22°F) to + 70° C (158° F).
Humidity (Operating & Storage):
5 - 95% RH non-condensing

11.7 Material Chart

Cabinet front: Poly Cabonate/Acrylonitrile Butadiene Styrene (PC/ABS)
Protector for front: Styrene Ethylene Betyl Styrene (SEBS)
Cabinet back: PC/ABS
Cabinet base w/Protector: PC/ABS + SEBS
Battery door: SEBS
Connector retainer for battery:
Poly Oxy Methylene (POM)
Operating Knob: POM
Rotor for Operating Knob: PC/ABS
Manifold for vacuum: POM
Canister Holder: Polyethylene (PE)
Handle w/Protector: PC/ABS + SEBS
Manifold for exhaust: POM
Strap for patient suction tubing: SEBS
Canister Holder Release Arm: POM
User Interface: Polyester
Vacuum Connector: Silicone
Vacuum Connector Tubing: Silicone
Abbott Canister: PC
Abbott Disposable Liner: ABS + PVC
Abbott Patient Suction Tubing:
Polyvinylchloride "flexible" (PVC)
Suction Catheter Adapter: PC
Suction Catheter Adapter Holder: PC
LSU Reusable Canister: PC - HT
Lid w/Floater Valve Cylinder,
LSU Reusable Canister: PC - HT
Gasket for Lid, LSU Reusable Canister: Silicone
Full covering Carrying Bag: PVC coated Polyester
Side Pouch: PVC coated Polyester
Shoulder Strap: POM + Polyester
Wallbracket: Aluminium + Steel + PA with fibers
Aerosol Filter, LSU Reusable Canister: PP
Filter Tubing, LSU Reusable Canister: Silicone
Float Ball, LSU Reusable Canister: PP
Vacuum Plug, LSU Reusable Canister: Silicone

11.7.1 Dismantling/Disposal

When discarding the LSU, we recommend it be dismantled and discarded according to local protocol. Dismantle the LSU by unscrewing the screws on the back side of the LSU, remove the components and sort according to the table in 11.7.

The cleaned LSU can also be delivered to your local Laerdal Medical representative for dismantling/disposal. Laerdal Medical AS will not charge any fee for the dismantling; Sender is reponsible for the cost of the shipment.

11.8 Symbols

⎓ (Direct Current).

~ (Alternating Current).

Class II Equipment, according to IEC 601-1 (1988)

Type BF applied part, according to 601-1 (1988)

IP34D Protection class ref. IEC 529 (1989).

CE This product is in compliance with the essential requirements of MDD 93/42/EEC.

Do not reuse.

Date of production.

See Directions for Use.

REF Unique product type identification

This product complies with the following ANSI/UL and CSA standards

CSA Standards: CAN/CSA-C22.2 No:	0-M91	General Requirements – Canadian Electrical Code, part II
CAN/CSA-C22.2 No:	601.1-M90	Medical Electrical Equipment Part I: General Requirements for Safety
CAN/CSA-C22.2 No:	601.1S1-94	Supplement No 1-94 to CAN/CSA-C22.2 No. 601.1-M90 – Medical Electrical Equipment – Part 1: General Requirements for Safety US Standards:
UL Standard No:	2601.1	Medical Electrical Equipment

11.10 EMC Specifications

MEDICAL ELECTRICAL EQUIPMENT needs special precautions regarding EMC and needs to be installed and put into service according to the EMC provided in this section.

Portable and mobile RF communication equipment can affect MEDICAL ELECTRICAL EQUIPMENT.

Warning:

MEDICAL ELECTRICAL EQUIPMENT should not be used adjacent to or stacked with other equipment. If adjacent or stacked use is necessary, the MEDICAL ELECTRICAL EQUIPMENT should be observed to verify normal operation in the configuration in which it will be used.

Maximum cable length, AC Power cord:
1.5 meters
Maximum cable length, DC Power cord:
1.5 meters

Warning

The use of accessories, transducers and cables other than those specified, with exception of transducers and cables sold by Laerdal as replacement parts for internal components, may result in increased emission or decreased immunity of the LSU.

Guidance and manufacturer's declaration – electromagnetic immunity			
The Laerdal Suction Unit (LSU) is intended for use in the electromagnetic environment specified below. The customer or the user of the LSU should assure that it is used in such an environment.			
Immunity test	**IEC 60601-1-2 test level**	**Compliance level**	**Electromagnetic environment - guidance**
Electrostatic discharge (ESD) IEC 61000-4-2	±6 kV contact ±8 kV air	±6 kV contact ±8 kV air	Floors should be wood, concrete or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30%.
Electrical fast transient/burst. IEC 61000-4-4	±2 kV for power supply lines	±2 kV for power supply lines	Mains power quality should be that of a typical commercial or hospital environment.
Surge IEC 61000-4-5	± 1 kV differential mode ± 2kV common mode	± 1 kV differential mode ± 2kV common mode	Mains power quality should be that of a typical commercial or hospital environment.
Voltage dips, short interruptions and voltage variations on power supply input lines. IEC 61000-4-11	< 5% U_T (> 95% dip in U_T) for 0,5 cycle 40% U_T (60% dip in U_T) for 5 cycles 70% U_T (30% dip in U_T) for 25 cycles < 5% U_T (> 95% dip in U_T) for 5 sec.	< 5% U_T (> 95% dip in U_T) for 0,5 cycle 40% U_T (60% dip in U_T) for 5 cycles 70% U_T (30% dip in U_T) for 25 cycles < 5% U_T (> 95% dip in U_T) for 5 sec.	Mains power quality should be that of a typical commercial or hospital environment.
Power Frequency (50Hz/60Hz) magnetic field. IEC 61000-4-8	3A/m	3A/m	Also in compliance at Power Frequency of 400Hz
NOTE: U_T is the AC mains voltage prior to application of the test level.			

Guidance and manufacturer's declaration – electromagnetic immunity		
The Laerdal Suction Unit (LSU) is intended for use in the electromagnetic environment specified below. The customer or the user of the LSU should assure that it is used in such an environment.		
Emissions tests	**Compliance**	**Electromagnetic environment - guidance**
RF emissions CISPR 11	Group 1	The LSU uses RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.
RF emissions CISPR 11	Class B	The LSU is suitable for use in all establishments, including domestic establishments and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes.
Harmonic emissions IEC 61000-3-2	Class A	
Voltage fluctuations/flicker emissions IEC 61000-3-3	Complies	

Guidance and manufacturer's declaration – electromagnetic immunity			
The Laerdal Suction Unit (LSU) is intended for use in the electromagnetic environment specified below. The customer or the user of the LSU should assure that it is used in such an environment.			
Immunity test	**IEC 60601-1-2 test level**	**Compliance level**	**Electromagnetic environment - guidance**
Conducted RF IEC/EN 61000-4-6	3 Vrms 150 kHz to 80 MHz	3 Vrms	Portable and mobile RF communications equipment should be used no closer to any part of the LSU, including cables, than the recommended separation distance calculated from the equation applicable to frequency of the transmitter. Recommended separation distance d=1.2 •P d=0.35•P 80 MHz to 800 MHz
Radiated RF IEC/EN 61000-4-3	3 V/m 80 MHz to 2,5 GHz	10 V/m	d=0.7•P 800 MHz to 2,5 GHz where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and d is the recommended separation distance in meters (m). Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey[a], should be less than the compliance level in each frequency range[b]. Interference may occur in the vicinity of equipment marked with the following symbol:
NOTE 1. At 80 MHz and 800 MHz, the higher frequency range applies. NOTE 2. These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.			

a. Field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and land mobile radios, amateur radio, AM and FM radio broadcast and TV broadcast cannot be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength in the location in which the LSU is used exceeds the applicable RF compliance level above, the LSU should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as reorienting or relocating the LSU.

b. Over the frequency range 150 kHz to 80 MHz, field strength should be less than 3 V/m.

12 Addresses

Manufacturer:
Laerdal Medical AS
Stavanger, Norway

Distribution:
For World Wide distribution,
see Global Warranty or
www.laerdal.com

Laerdal

helping save lives

CE 0434

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